

## KEY TO THE MOSS GENERA OF NORTH AMERICA NORTH OF MEXICO

Dale H. Vitt  
Department of Botany  
University of Alberta  
Edmonton, Alberta T6G 2E9, Canada

William R. Buck  
New York Botanical Garden  
Bronx, NY 10458-5126, U.S.A.

Traditionally, mosses have been considered by many to present severe difficulties in identification of both species and genera. However, often if the genus is known, species identification follows with much less difficulty. Moreover, most regional moss floras present keys to species beginning at either the family or genus rank. We present here a key to the genera of mosses found in North America, north of Mexico. The key is strictly dichotomous and attempts were made to use gametophytic features whenever possible.

Mosses (Class Bryopsida or Musci) are the largest group of plants in the Bryophyta, and are the third largest class of green land plants in North America following the Monocots and Dicots. The recently published lists of North American mosses (Anderson *et al.* 1990 [Andreaeidae and Bryidae]; Anderson 1990 [Sphagnidae]) tabulate 1320 species in 312 genera. To these, we add the genus *Takakia* with two species (Murray 1988; Smith *et al.* 1990). Within the 313 genera of mosses found in North America, 15 have 15 or more species. Only two genera have more than 50 species—*Sphagnum* with 72 and *Bryum* with 66; five genera have 30 or species (*Orthotrichum*—37, *Fissidens*—36, *Grimmia* and *Brachythecium* each with 34, and *Pohlia*—30). Other large genera are *Tortula* (29), *Dicranum* (27), *Racomitrium* (24), *Hypnum* (21), *Campylopus* (18), *Hygrohypnum* (18), *Encalypta* (16), and *Polytrichum* (15). These 15 genera contain 476 or 36% of the North American species.

Historically, keys to mosses have used growth form (acrocarpy *vs.* pleurocarpy) as a major dichotomy. We have resisted the use of this character whenever possible, and instead placed more emphasis on microscopic features of the leaves; namely the presence, absence and number of costae found on leaves and on the ornamentation of leaf cells (papillose *vs.* smooth).

Generic concepts depend largely on previous monographic work completed in particular families. Some North American families have had no recent generic revision, while others have newly revised generic concepts in place. We have followed the generic concepts presented in Anderson *et al.* (1990), including the recognition of segregate genera in the Mniaceae, Amblystegiaceae, and Grimmiaceae. These generic concepts differ somewhat from those accepted in the Canadian (Ireland *et al.* 1987) and European checklists (Corley *et al.* 1981).

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Floristic treatments of North American mosses are available for many areas of the continent, and date back to the 1880's when Lesquereux and James (1884) published the first treatment of mosses of the continent. Still a valuable source of information and the only flora that treats the southwestern United States is Grout's *Moss Flora of North America* (Grout 1931-40). In more recent times (since 1970) several excellent regional floras have been written and form the basis of our understanding of North American mosses. Included are the following manuals: Eastern North America—Crum and Anderson (1981); the United States Pacific Northwest—Lawton (1971); Utah—Flowers (1973); northern Michigan—Crum (1973); Maritime Provinces of Canada—Ireland (1982); the southeastern Gulf Shore—Reese (1984); the Interior Highlands—Redfearn (1983); and northwestern North America—Vitt *et al.* (1988). Definition of terms used in this key follow those given in Crum and Anderson (1981) and in Magill (1990).

We have the great privilege to dedicate this key to Howard Crum, our teacher and good friend. His patience and perseverance in performing the unenviable task of teaching both of us the fundamentals of science and bryology are remarkable. Without him, neither of us would have been able to complete the present work. To Howard Crum we give our heartfelt thanks.

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|--|----------------------|
| 1. Gametophytes seemingly absent (consisting only of protonemata); sporophytes of asymmetric capsules and papillose setae .....            | <i>Buxbaumia</i>     |
| 1. Gametophytes present (with obvious leaves); sporophytes various .....   | 2                    |
| 2. Leaf cells arranged in a network of narrow, green cells alternating with large hyaline cells; branches usually in clusters .....        | <i>Sphagnum</i>      |
| 2. Leaf cells of one kind (green), or if of two kinds, branches never in clusters .....  | 3                    |
| 3. Leaves attached in two rows on opposite sides of the stem (distichous) .....  | 4                    |
| 3. Leaves attached all around the stem (foliate stems sometimes flattened [complanate]) .....  | 7                    |
| 4. Leaves appearing split at the base, consisting of two vaginant laminae which clasp the stem and base of the leaf above (equitant) ..... | <i>Fissidens</i>     |
| 4. Leaves with expanded bases, not clasping leaf above .....   | 5                    |
| 5. Leaves ecostate; protonemata luminous .....   | <i>Schistostega</i>  |
| 5. Leaves unicostate; protonemata not luminous .....   | 6                    |
| 6. All leaves with a rough (papillose), linear subula .....  | <i>Distichium</i>    |
| 6. Vegetative leaves with a smooth mucro; perichaetial leaves with a smooth subula .....   | <i>Bryoxiphium</i>   |
| 7. Leaves with lamellae or filaments on the adaxial (upper) surface of the costa (excluding propagula) .....                               | 8                    |
| 7. Leaves without lamellae or filaments on the adaxial surface of the costa (but propagula sometimes present) .....                        | 23                   |
| 8. Leaves with filaments on the adaxial surface of the costa .....   | 9                    |
| 8. Leaves with lamellae on the adaxial surface of the costa .....  | 10                   |
| 9. Leaf margins broadly inrolled (and mostly obscuring the filaments) .....  | <i>Aloina</i>        |
| 9. Leaf margins reflexed to revolute .....   | <i>Crossidium</i>    |
| 10. Leaves bordered with elongate cells .....  | <i>Atrichum</i>      |
| 10. Leaves without elongate, marginal cells .....  | 11                   |
| 11. Leaves ciliate at upper part of hyaline sheath .....   | <i>Bartramiopsis</i> |
| 11. Leaves ciliate .....   | 12                   |

12. Upper leaf margins bistratose with paired, multicellular teeth; leaf apices with slender, smooth, caducous awns; restricted to the arctic  
 ..... *Lyellia*
12. Upper leaf margins unistratose with single teeth or entire; leaf apices mucicous or with serrate awns ..... 13
13. Lamellae 2-4; leaves hyaline awned; plants small, less than 5 mm; peristome none or rudimentary and fragile ..... *Pterygoneurum*
13. Lamellae 4-50; leaves mostly not awned; plants mostly larger; peristome of 32 or 64 persistent teeth ..... 14
14. Lamellae distinctly wavy ..... 15
14. Lamellae straight ..... 16
15. Upper leaf margins with border of hyaline, short-rhombic cells ..... *Psilopilum*
15. Upper leaf margins not bordered ..... *Oligotrichum*
16. Leaf laminae with teeth on abaxial (back) surface; calyptrae naked or with a few hairs ..... *Oligotrichum*
16. Leaf laminae smooth at back; calyptrae densely hairy ..... 17
17. Plants with capsules ..... 18
17. Plants without capsules ..... 20
18. Capsules (2-4)(-6)-angled ..... *Polytrichum*
18. Capsules cylindric ..... 19
19. Capsules without stomates; lumina of apical cells of lamellae not pyriform  
 ..... *Pogonatum*
19. Capsules with stomates; lumina of apical cells of lamellae pyriform  
 ..... *Polytrichastrum*
20. Apical cells of lamellae smooth or with faint cuticular ridges ..... 21
20. Apical cells of lamellae papillose ..... 22
21. Plants small, less than 6 mm high; leaves never awned ..... *Pogonatum*
21. Plants larger; leaves with or without awns ..... *Polytrichum*
22. Apical cells of lamellae rounded, quadrate or oblate ..... *Pogonatum*
22. Apical cells elliptic-pyriform ..... *Polytrichastrum*
23. Leaves deeply lobed with lobes linear-terete ..... *Takakia*
23. Leaves never lobed, flattened (although sometimes concave with margins inrolled or recurved) ..... 24
24. Leaves without a costa or costa short and double, double, or single with 2-3 lateral spurs ..... 25
24. Leaves with a single costa to at least midleaf ..... 114
25. Although appearing none, costa single and occupying entire leaf area, thus leaf appearing multistratose ..... 26
25. Costa truly none or double; lamina always unistratose ..... 27
26. Leaves ligulate; green cells (chlorocysts) three-sided in section  
 ..... *Octoblepharum*
26. Leaves lanceolate; green cells four-sided in section ..... *Leucobryum*
27. Upper leaf cells papillose or prurlose ..... 28
27. Upper leaf cells smooth (rarely with minute cuticular roughenings) .... 46
28. Leaf apices hyaline ..... 29
28. Leaf apices concolorous ..... 30
29. Leaf cells with a single, unbranched papilla (on each surface); capsules exerted, ribbed; perichaetial leaves entire; restricted to western North America  
 ..... *Pseudobraunia*
29. Leaf cells with 1-2 forked papillae (on each surface); capsules immersed, smooth; perichaetial leaves ciliate; widespread ..... *Hedwigia*

30. Leaf cells pluripapillose	31
30. Leaf cells unipapillose or prorulose	33
31. Papillae arranged in rows over the lumina; leaf cells more than 5:1	<i>Taxithelium</i>
31. Papillae randomly arranged over lumina; leaf cells less than 4:1	32
32. Leaves obtuse; stems complanate-foliate	<i>Erpodium</i>
32. Leaves short-acuminate; stems symmetrically foliate	<i>Braunia</i>
33. Plants 2-3-pinnate, each year forming a flattened frond, the fronds arranged in a stair-step ascending pattern	<i>Hylocomium</i>
33. Plants simple or 1-pinnate, not forming ascending fronds	34
34. Leaves plicate	35
34. Leaves not plicate	36
35. Costa double and extending to above midleaf; leaves spreading to squarrose	<i>Rhytidiadelphus</i>
35. Costa short and double; leaves falcate-secund	<i>Ctenidium</i>
36. Plants reddish-black, occurring tightly attached to rocks	<i>Andreaea</i>
36. Plants greenish, occurring on various substrates	37
37. Plants minute, less than 2 mm, acrocarpous	<i>Ephemerum</i>
37. Plants large, more than 1 cm, pleurocarpous	38
38. Costa strong and double, extending to near leaf apex	<i>Callicostella</i>
38. Costa short and double, ending below midleaf	39
39. Alar cells numerous, oblate to rounded, strongly differentiated and extending up the margins; restricted to Pacific Northwest	<i>Pterogonium</i>
39. Alar cells few, mostly quadrate, scarcely extending up the margins; widespread	40
40. Cells at midleaf more than 5:1	41
40. Cells at midleaf less than 5:1	43
41. Apical leaf cells much shorter than those at midleaf	<i>Taxiphyllum</i>
41. Apical leaf cells scarcely differentiated	42
42. Leaves slenderly acuminate; prorulose at both upper and lower ends of cells	<i>Chryso-hypnum</i>
42. Leaves acute; prorulose only at upper ends of cells	<i>Leptohyenum</i>
43. Stem and branch leaves differentiated	<i>Heterocladium</i>
43. Stem and branch leaves similar	44
44. Leaves broadly ovate, concave, obtuse to obtuse-apiculate	<i>Myurella</i>
44. Leaves lanceolate to ovate-lanceolate, acute to acuminate	45
45. Leaves acute, serrulate only above; propagula often in leaf axils; northern in distribution	<i>Pterigynandrum</i>
45. Leaves acuminate, serrulate throughout; propagula absent; eastern U.S. in distribution	<i>Schwetschkeopsis</i>
46. Leaves ending in a hyaline awn	47
46. Leaves concolorous at apex	48
47. Leaf cells 2:1 or less, oblate-hexagonal throughout; eperistomate	<i>Erpodium</i>
47. Leaf cells more than 3:1, upper cells shortly rhomboidal, basal cells quadrate; peristomate	<i>Venturiella</i>
48. Plants aquatic, occurring submerged at least part of the year; leaves keeled or flat	<i>Fontinalis</i>
48. Plants sometimes in wet habitats but never occurring submerged; leaves various but never keeled	49
49. Plants acrocarpous, usually less than 4 cm	50
49. Plants pleurocarpous, mostly larger	53

50. Plants occurring on rock ..... 51  
 50. Plants occurring on bare soil ..... 52
51. Plants reddish-black; capsules valvate ..... *Andreaea*  
 51. Plants greenish-brown; capsules with four peristome teeth ..... *Tetradontium*
52. Protonemata abundant; capsules ovoid, apiculate; calyptrae campanulate-mitrate, deciduous ..... *Ephemerum*  
 52. Protonemata sparse; capsules globose; calyptrae very small, persistent ..... *Micromitrium*
53. Costa single with one or sometimes two supplementary costae on each side ..... *Antitrichia*
53. Costa double, or if single very short and without supplementary costae ..... 54
54. Costa long and double, extending to or beyond midleaf ..... 55  
 54. Costa short and double, usually ending just above leaf base ..... 59
55. Stems with numerous paraphyllia ..... 56  
 55. Stems lacking paraphyllia ..... 57
56. Stem leaves plicate, decurrent ..... *Hylocomium*  
 56. Stem leaves not plicate or decurrent ..... *Loeskeobryum*
57. Leaf cells thin-walled, lax, abruptly bordered by elongate cells ..... *Cyclodictyon*
57. Leaf cells firm-walled, not or only gradually bordered ..... 58
58. Plants forming mats; leaves falcate-secund at least at branch apices; exostome teeth striate, furrowed ..... *Trachyxiophium*  
 58. Plants tufted; leaves somewhat contorted when dry but not falcate; exostome teeth papillose, not furrowed ..... *Lepidopilum*
59. Leaves obtuse; plants small, rare, restricted to the mountains of southeastern U.S. .... 60
59. Leaves acute to acuminate, at least apiculate; plants mostly larger, widespread ..... 61
60. Leaves asymmetric with a basal lobe ..... *Homaliadelphus*  
 60. Leaves symmetric without lobe ..... *Bryocrumia*
61. Leaf cells lax, hexagonal ..... 62  
 61. Leaf cells firm- to thick-walled, rounded to linear ..... 63
62. Lateral and dorsal leaves differentiated in areolation; stems pinnately branched ..... *Vesicularia*  
 62. Lateral and dorsal leaves with similar areolation; stems irregularly branched ..... *Hookeria*
63. Leaves slenderly long-decurrent ..... *Plagiothecium*
63. Leaves not at all decurrent to broadly auriculate ..... 64
64. Plants slender, thread-like; leaves mostly less than 1 mm long ..... 65  
 64. Plants larger; leaves more than 1 mm long ..... 67
65. Branch leaves more than 0.5 mm long ..... *Homomallium*  
 65. Branch leaves less than 0.5 mm long ..... 66
66. Costa short and single; leaf cells rounded-elliptic ..... *Pseudoleskeella*  
 66. Costa none or very short and double; leaf cells rhombic ..... *Platydictya*
67. Leaves falcate-secund ..... 68  
 67. Leaves straight ..... 84
68. Upper leaf cells oblong-rhombic, ca. 3:1 ..... 69  
 68. Leaf cells more or less linear, more than 6:1 ..... 70
69. Alar cells numerous, oblate, extending up the margins in many rows ..... *Leucodon*

69. Alar cells few, oblong-quadrate, in 1-2 rows along the insertion ..... *Sematophyllum*
70. Plants regularly and closely pinnate, feather-like; fronds flat, erect to ascending, oblong-triangular ..... *Ptilium*
70. Plants irregularly pinnate to unbranched, not feather-like; stems prostrate to loosely ascending ..... 71
71. Mature branches erect and producing abundant and conspicuous propagula in their upper leaf axils ..... *Platygyrium*
71. Branches not producing propagula in leaf axils ..... 72
72. Branches curved-secund when dry, erect when moist; alar cells small and quadrate ..... *Pylaisiella*
72. Branches little altered when dry; alar cells various ..... 73
73. Alar cells when differentiated quadrate, sometimes enlarged but not at all inflated ..... 74
73. Alar cells quadrate to oblong, inflated ..... 79
74. Stems with paraphyllia ..... *Rhytidiopsis*
74. Stems without paraphyllia ..... 75
75. Plants very large (stem leaves 3.5-5.0 mm), stems ascending to erect; leaves plicate ..... *Rhytidiadelphus*
75. Plants smaller (stem leaves less than 3.5 mm), stems prostrate to ascending; leaves various ..... 76
76. Alar cells none or very few; pale propagula often clustered in leaf axils ..... *Isopterygiopsis*
76. Alar cells distinctly differentiated; clustered propagula lacking ..... 77
77. Plants occurring on wet rocks in mountain streams ..... *Hygrohypnum*
77. Plants in various habitats but not as above ..... 78
78. Costa to ca.  $\frac{1}{2}$  the leaf length with the two forks not meeting at the base; plants of Alaska and Yukon ..... *Gollania*
78. Costa mostly shorter, the forks joining at the base; plants widespread ..... *Hypnum*
79. Plants occurring in calcareous fens or marl pools, dark reddish-brown; leaves obtuse ..... *Scorpidium*
79. Plants occurring in other habitats, golden to green; leaves acute to acuminate ..... 80
80. Plants occurring on wet rocks in mountain streams ..... *Hygrohypnum*
80. Plants in various habitats but not as above ..... 81
81. Alar cells thick-walled, inflated in several rows; leaf margins strongly serrate ..... *Heterophyllum*
81. Alar cells inflated in 1(-2) rows, or if more, thin-walled; leaf margins entire to serrulate ..... 82
82. Stems surrounded by enlarged, thin-walled, hyaline cortical cells (hyalodermis); alar cells in large, subdecurrent areas ..... *Hypnum*
82. Stems surrounded by small, thick-walled, concolorous cells; alar cells in 1(-2) rows ..... 83
83. Plants very shiny; leaves 0.8-1.4 mm long, densely serrulate above; capsules inclined, asymmetric ..... *Brotherella*
83. Plants slightly shiny; leaves 0.5-1.1 mm long, distantly serrulate above; capsule erect, symmetric ..... *Pylaisiadelpha*
84. Stem leaves abruptly contracted to long setaceous point ..... 85
84. Stem leaves acute, acuminate or apiculate ..... 86

85. Leaf apices hyaline; alar cells scarcely differentiated ..... *Iwatsukiella*
85. Leaf apices yellow; alar cells inflated and hyaline ..... *Wijkia*
86. Leaves squarrose-recurved when dry, with channeled apices ..... 87
86. Leaves erect to spreading, or if squarrose only when moist, the apices mostly not channeled ..... 88
87. Stem leaves greater than 2.5 mm long; alar cells oblong, somewhat inflated, intramarginal ..... *Rhytidiadelphus*
87. Stem leaves less than 2.5 mm long; alar cells subquadrate, not at all inflated, marginal ..... *Campylium*
88. Plants occurring on wet rocks in mountain streams; leaves ovate, concave ..... *Hygrohypnum*
88. Plants in other habitats but not as above; leaves various ..... 89
89. Stems complanate-foliate ..... 90
89. Stems symmetrically foliate ..... 96
90. Alar cells numerous and quadrate; capsules erect ..... *Entodon*
90. Alar cells few, variously shaped; capsules usually inclined ..... 91
91. Plants occurring on vertical substrates, tree trunks or rocks ..... *Neckera*
91. Plants occurring on horizontal substrates, rarely the extreme bases of trees ..... 92
92. Leaf margins serrulate throughout ..... 93
92. Leaf margins entire or serrulate only in upper half ..... 94
93. Apical leaf cells shorter than those at midleaf ..... *Taxiphyllum*
93. Apical leaf cells undifferentiated ..... *Herzogiella*
94. Rhizoids arising from leaf axils, papillose; leaf margins more or less entire ..... *Isopterygiopsis*
94. Rhizoids arising from below leaf insertion, smooth; leaf margins serrulate above ..... 95
95. Pseudoparaphyllia filamentous; annuli not differentiated; plants mostly monoicous ..... *Isopterygium*
95. Pseudoparaphyllia absent; annuli differentiated; plants mostly dioicous ..... *Pseudotaxiphyllum*
96. Alar cells inflated ..... 97
96. Alar cells rectangular to quadrate, not inflated ..... 101
97. Plants erect; stems with hyalodermis; alar cells hyaline and in auricles ..... *Calliergonella*
97. Plants prostrate; stems without hyalodermis; alar cells yellowish, not in auricles ..... 98
98. Alar cells uniform, without an enlarged basal row; stem apices flattened ..... *Callicladium*
98. Alar cells with an enlarged basal row; stem apices not flattened ... 99
99. Alar cells rounded to the insertion; exostome teeth furrowed .. *Acroporium*
99. Alar cells not rounded to insertion; exostome teeth not furrowed .... 100
100. Exostome teeth striate; endostome with evident basal membrane and segments; eastern North America ..... *Sematophyllum*
100. Exostome teeth smooth or faintly papillose; endostome fugaceous, appearing absent; restricted to oak scrub in central Florida ..... *Donnellia*
101. Plants with numerous (more than 50), quadrate alar cells, extending up the margins by more than 12 rows ..... 102
101. Plants with fewer (less than 25), quadrate to rectangular alar cells, extending up the margins in less than 8 rows ..... 107

102. Stems with numerous paraphyllia ..... *Alsia*  
 102. Stems lacking paraphyllia ..... 103
103. Leaves less than 0.8 mm long; cells with obscure cuticular roughenings;  
 western montane ..... *Leptopterigynandrium*  
 103. Leaves more than 1 mm long; cells smooth ..... 104  
 104. Alar cells extending up the margins for less than  $\frac{1}{2}$  the leaf length  
 ..... 105  
 104. Alar cells extending up the margins for more than  $\frac{1}{2}$  the leaf length  
 ..... 106
105. Leaves acuminate, somewhat decurrent; endostome with cilia; plants restricted  
 to coastal western North America, California to British Columbia  
 ..... *Tripterocladium*  
 105. Leaves mostly obtuse to acute, rarely acuminate, never decurrent; endo-  
 stome lacking cilia; plants widespread but not in coastal western North  
 America ..... *Entodon*  
 106. Secondary stems freely subpinnately branched ..... *Forsstroemia*  
 106. Secondary stems simple or with few branches ..... *Leucodon*
107. Plants epiphytic with creeping primary stems and erect secondary stems  
 ..... 108
107. Plants terrestrial or rarely on bases of trees, primary and secondary stems  
 not differentiated ..... 109  
 108. Secondary stems unbranched; leaves spreading with squarrose tips;  
 propagula common ..... *Jaegerina*  
 108. Secondary stems irregularly branched; leaves erect; propagula ab-  
 sent ..... *Neomacounia*
109. Stems with hyalodermis; leaf margins serrulate to base ..... *Herzogiella*  
 109. Stems without hyalodermis; leaf margins entire or serrulate above ... 110  
 110. Leaves plicate ..... *Orthothecium*  
 110. Leaves not plicate ..... 111
111. Leaf apices obtuse-apiculate ..... 112  
 111. Leaf apices acuminate ..... 113  
 112. Plants occurring in fens; stems green, sparsely branched  
 ..... *Pseudocalliergon*  
 112. Plants widespread in acidic habitats of the boreal forest; stems  
 reddish-orange, pinnately branched ..... *Pleurozium*
113. Leaf cells porose throughout; pseudoparaphyllia absent or foliose; plants  
 in boreal, arctic and alpine habitats ..... *Orthothecium*  
 113. Leaf cells not porose except at insertion; pseudoparaphyllia filamentous;  
 plants of coastal eastern North America inland to the Midwest  
 ..... *Isopterygium*  
 114. Plants erect, dendroid or frondose from a nonbranched stipe ... 115  
 114. Plants prostrate to erect, simple to pinnately branched ..... 121
115. Leaves bordered by elongate cells ..... 116  
 115. Leaves not bordered ..... 117  
 116. Plants with two kinds of leaves, the larger ones with costa ending  
 well below apex, the smaller ones (amphigastria) with excurrent  
 costa ..... *Hypopterygium*  
 116. Plants with leaves all of one kind, the costa subpercurrent  
 ..... *Leucolepis*
117. Stems with paraphyllia or filamentous, paraphyllia-like structures .... 118



117. Stems without paraphyllia ..... 120
118. Plants epiphytic; stems pinnately frondose, curled when dry, spreading when moist ..... *Dendroalsia*
118. Plants terrestrial (rarely on tree bases); stems dendroid, little altered when dry ..... 119
119. Branch leaves long-decurrent, the decurrencies of inflated, hyaline cells; stems with lamellae; stem leaves with entire margins ..... *Pleuroziopsis*
119. Branch leaves cordate to auriculate, the auricles not inflated; stems with paraphyllia; stem leaves with serrate margins ..... *Climacium*
120. Apical cells of branch leaves rhombic; costa of branch leaves strong, not tapering toward apex ..... *Thamnobryum*
120. Apical cells of branch leaves long-hexagonal; costa of branch leaves slender, tapering toward apex ..... *Porotrichum*
121. Plants blackish, tightly attached to rocks in arctic and montane areas; capsules valvate ..... 122
121. Plants greenish to blackish, on various substrates; capsules cleistocarpous or operculate, never valvate ..... 123
122. Plants occurring on calcareous rocks; capsules not hygroscopic, turbinate, obtuse-conic ..... *Andreaebryum*
122. Plants occurring on acidic rocks; capsules hygroscopic, when moist elliptic, tapering to a point ..... *Andreaea*
123. Leaves strongly squarrose-recurved wet or dry; plants occurring in fens ..... *Paludella*
123. Leaves erect to squarrose; plants occurring in various habitats ..... 124
124. Stems with paraphyllia ..... 125
124. Stems lacking paraphyllia ..... 142
125. Stems complanate-foliate; stem leaves undulate ..... *Metaneckera*
125. Stems symmetrically foliate; leaves not undulate ..... 126
126. Alar cells inflated in well marked groups ..... 127
126. Alar cells mostly not differentiated, if so, not inflated ..... 128
127. Stem leaves deeply plicate; paraphyllia filamentous, abundant ..... *Palustriella*
127. Stem leaves not plicate; paraphyllia foliose, sparse to abundant ..... *Cratoneuron*
128. Paraphyllia with short cells, 1-3:1 ..... 129
128. Paraphyllia with elongate cells, more than 5:1 ..... 140
129. Cells of paraphyllia papillose ..... 130
129. Cells of paraphyllia smooth ..... 134
130. Leaf cells unipapillose ..... 131
130. Leaf cells pluripapillose ..... 132
131. Plants once-pinnate; leaf cells papillose on both surfaces ..... *Abietinella*
131. Plants 2-3-pinnate; leaf cells papillose only at back ..... *Thuidium*
132. Plants large, dioicous; leaf cells papillose only at back ..... *Thuidium*
132. Plants small, autoicous; leaf cells papillose on both surfaces ..... 133
133. Plants once-pinnate; leaves not incurved when dry; leaf cells strongly bulging; setae smooth ..... *Rauvella*
133. Plants 1-2-pinnate; leaves incurved when dry; leaf cells flat; setae smooth or papillose ..... *Cyrto-hypnum*
134. Papillae of leaf cells large, either forked or elongate and curved; leaves broadly ovate ..... *Thelia*

134. Papillae of leaf cells small, simple; leaves lanceolate to ovate-lanceolate ..... 135
135. Costa pellucid; leaves usually with hair-points ..... *Claopodium*
135. Costa opaque; leaves lacking hair-points ..... 136
136. Stem and branch leaves differentiated ..... *Haplocladium*
136. Stem and branch leaves uniform ..... 137
137. Leaf cells isodiametric or nearly so, hexagonal to short-rhombic ..... 138
137. Leaf cells elongate, oblong-rhombic to oblong-linear ..... 139
138. Capsules inclined, asymmetric; exostome teeth striate; plants largely western ..... *Pseudoleskea*
138. Capsules erect, symmetric; exostome teeth pale and papillose; plants largely eastern ..... *Leskea*
139. Capsules erect, symmetric; endostome segments narrow, not keeled ..... *Lescuraea*
139. Capsules inclined, asymmetric; endostome segments broader, keeled ..... *Pseudoleskea*
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